Illumination (Lamps &Lighting)

- Illumination or lighting is the deliberate use of light to achieve a practical or aesthetic effect. In our context Lighting includes the use of artificial light sources like lamps and light fixtures in buildings.

- Proper lighting can enhance task performance, improve the appearance of an area, or have positive psychological effects on occupants..

- Light sources should be as small as possible, produce light efficiently and have a long life.

Type of Lamps

1- **Incandescent lamp**

2- **high-intensity discharge lamp (HID)**

- **Mercury-vapour lamp, Metal-halide** (HMI, HQI, CDM),

- **Sodium vapour** or "high-pressure sodium"

3-Fluorescent

Fluorescent lamp, compact fluorescent lamp (CFL),

6. Light-emitting diode (LED) light (solid-state lighting),

7- Fibber Optic light.

1- Incandescent lamp

Incandescent light bulbs consist of an air-tight glass enclosure (the envelope, or bulb) with a filament of tungsten wire inside the bulb, The bulb is filled with an inert gas such as argon (93%) and nitrogen (7%) to reduce evaporation of the filament and prevent its oxidation. The lamp is shown in Fig.1 . This lamp is called the general lighting service lamp (GLS).

1. Outline of Glass bulb
2. Low pressure inert gas
3. Tungsten filament
4. Contact wire (goes out of stem)
5. Contact wire (goes into stem)
6. Support wires
7. Stem (glass mount)
8. Contact wire (goes out of stem)
9. Cap (sleeve)
10. Insulation (vitrite)
11. Electrical contact

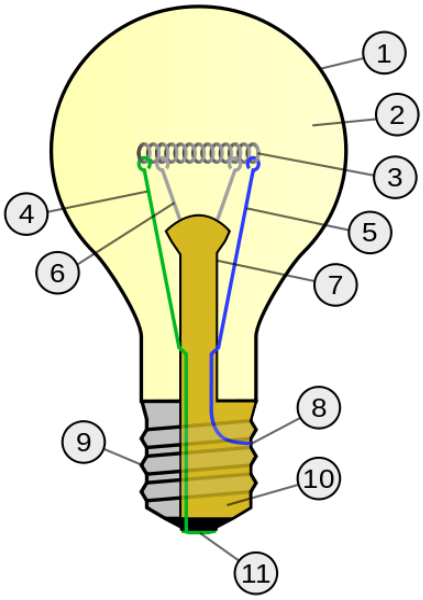


Fig.1 General lighting service incandescent lamp.

The **lumen & Lux**

- The **lumen** (symbol: **lm**) is the unit of luminous flux, a measure of the total "amount" of visible light emitted by a source.

- A **lux** is one lumen per square meter. Table -1 gives the output luminous flux in lumen for incandescent lamps.

Table-1	240 volt incandescent lamps	
Power (W)	**Output (lm)**	**Efficacy (lm/W)**
5	25	5
15	100	6.3
25	200	8.0
40	500	12.5
60	850	14.2
75	1,200	16.0
100	1,700	17.0
150	2,850	19.0
200	3,900	19.5
300	6,200	20.7

Standard Lamp Caps

Table-2

Lamps Caps		قاعدة المصباح
Description (التفاصيل)	التسمية	Symbol الرمز
Small bayonet cap قاعدة بايونت مسمارية صغيرة	**SBC**	**B15d**
Bayonet cap قاعدة بايونيت مسمارية اعتيادية	**BC**	**B22d**
قاعدة من البايونيت بثلاث مسامير	**3pin-BC**	**B22d-3**
قاعدة لولب اديسون صغير **Small Edison screw**	**SES**	**E14**
لولب اديسون اعتيادي **Edison screw**	**ES**	**E27**
لولب أديسون كبير(غولياث) **Goliath Edison screw**	**GES**	**E40**

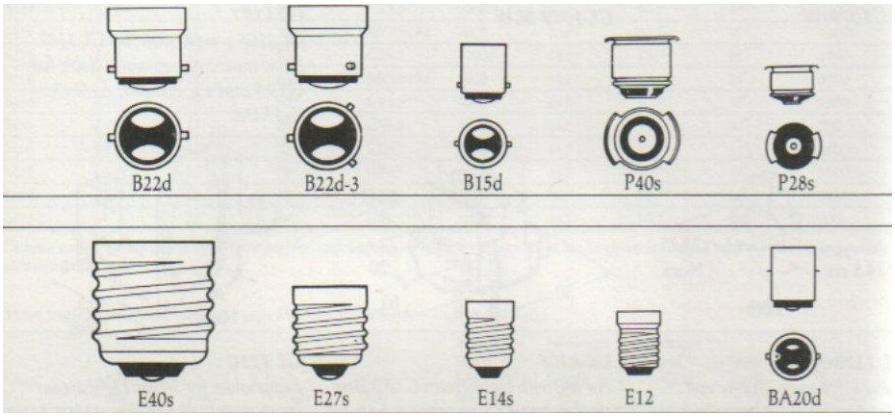


Fig.2 Incandescent lamps standard caps and various shapes of lamps

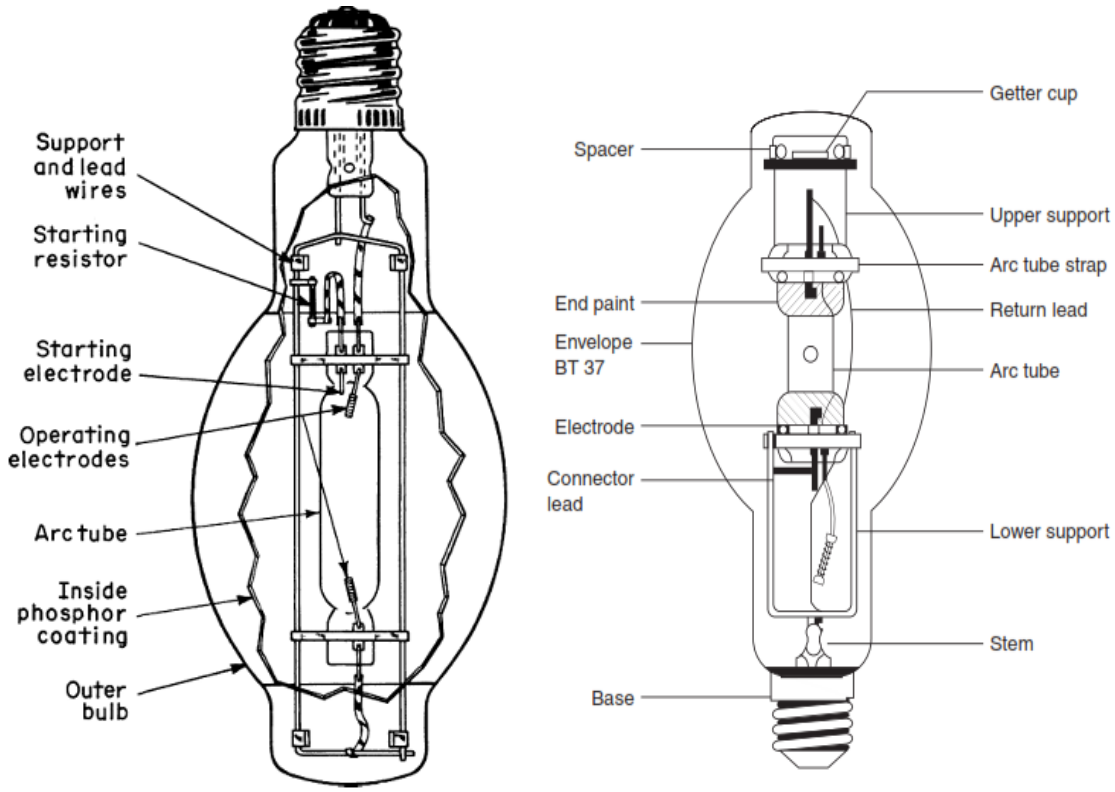
2-Halogen lamps

The lamp is filled with a halogen gas at low pressure, instead of an inert gas. Such bulbs are much smaller than normal incandescent bulbs, and are widely used where intense illumination is needed in a limited space. Useful life is three time the incandescent la

3- Gas-discharge lamp

❖ ***High-Intensity Discharge (HID).*** This term denotes a general group of lamps consisting of :

- Mercury-vapor lamps
- Metal halide lamps
- High – pressure sodium vapor lamps
- Xenon arc lamps



(a) (b)

FIGURE 3 (a) A 400-W phosphor-coated mercury lamp, (b) A metal-Halide lamp.

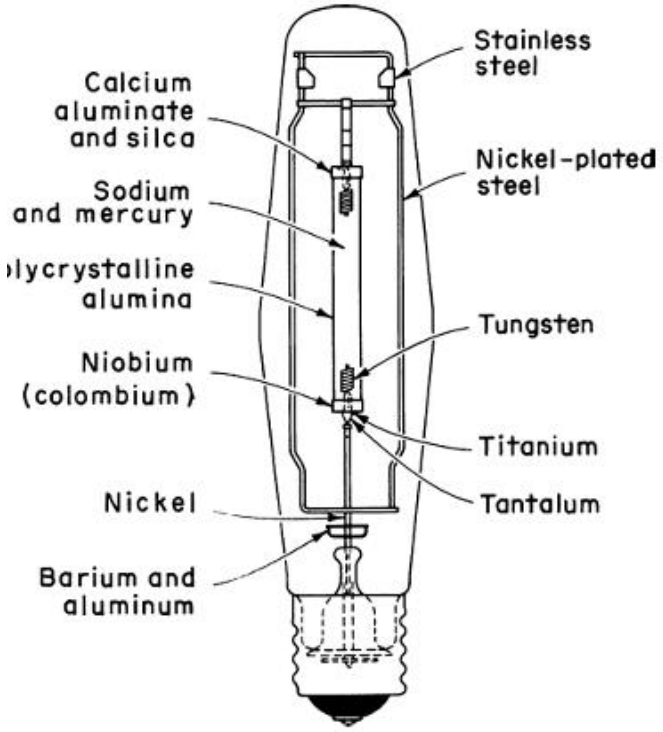


Fig.4 High – pressure sodium light.

❖ **Low-pressure discharge lamps**

- ***FLUORESCENT LAMPS***

Fluorescent lamps are low-pressure mercury electric-discharge lamps in which a phosphor coating transforms of the ultraviolet energy generated by the discharge arc into light. Fluorescent lamps are the most common lamp in office lighting and many other applications, produces up to 100 lumens per watt

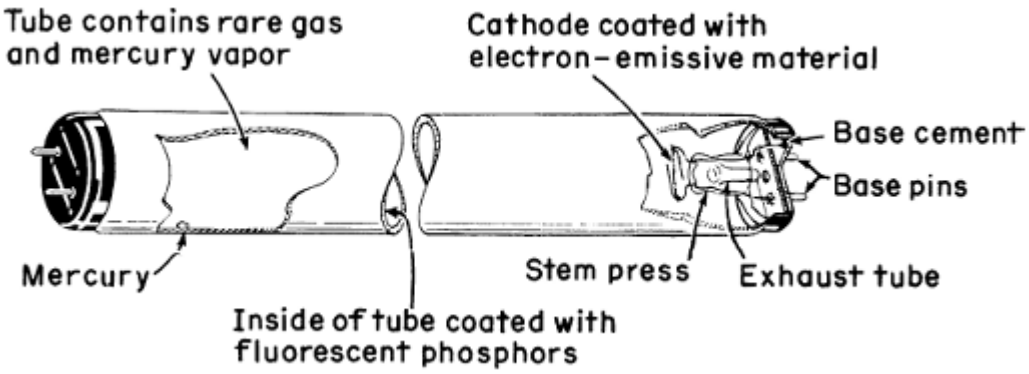


Fig.5 Cutaway view of fluorescent lamp.

- ***Compact Fluorescent Lamps.*** Energy-conservation activities have focused attention on the relatively low efficacy and short life of general-service 25- to 100-W incandescent lamps widely used in many residential, commercial, institutional, and industrial applications. Compact fluorescent lamps provide significantly higher efficacy and come in a variety of sizes and wattages

Fig.6 Compact fluorescent lamps.

- Low pressure sodium lamps, the most efficient gas-discharge lamp type, producing up to 200 lumens per watt, it produce yellow light which is the only acceptable colour for street lighting and similar applications.

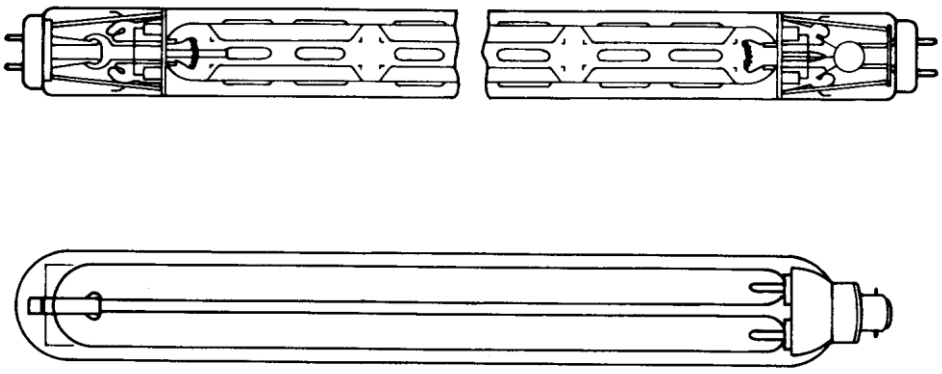


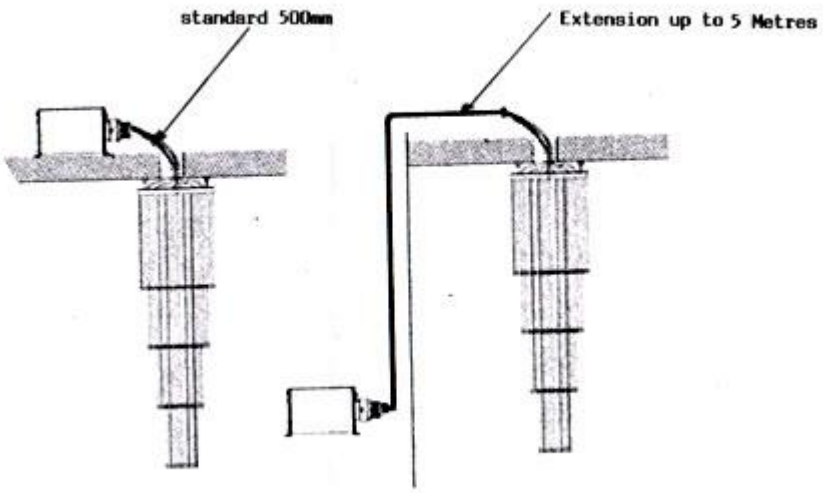
Fig.7 Low pressure sodium lamp.

4. **light-emitting diode** (**LED**)

This is a two-lead semiconductor light source that resembles a basic pn-junction diode, except that an LED also emits light.
Light sources should be as small as possible, produce light efficiently and have a long life. Only light emitting diodes (LEDs), also called light diodes, achieve this. They conform to the lighting designer's ideal of a pointlike light source: no other lamp possesses comparably small dimensions.

Fig.8 LED lamps

5. LASER Light



Light Source

Projector, with i high output 250W

Metal Halide lamp,

with ability to have two colour/effect

wheels fitted when required.

Fibre optic light